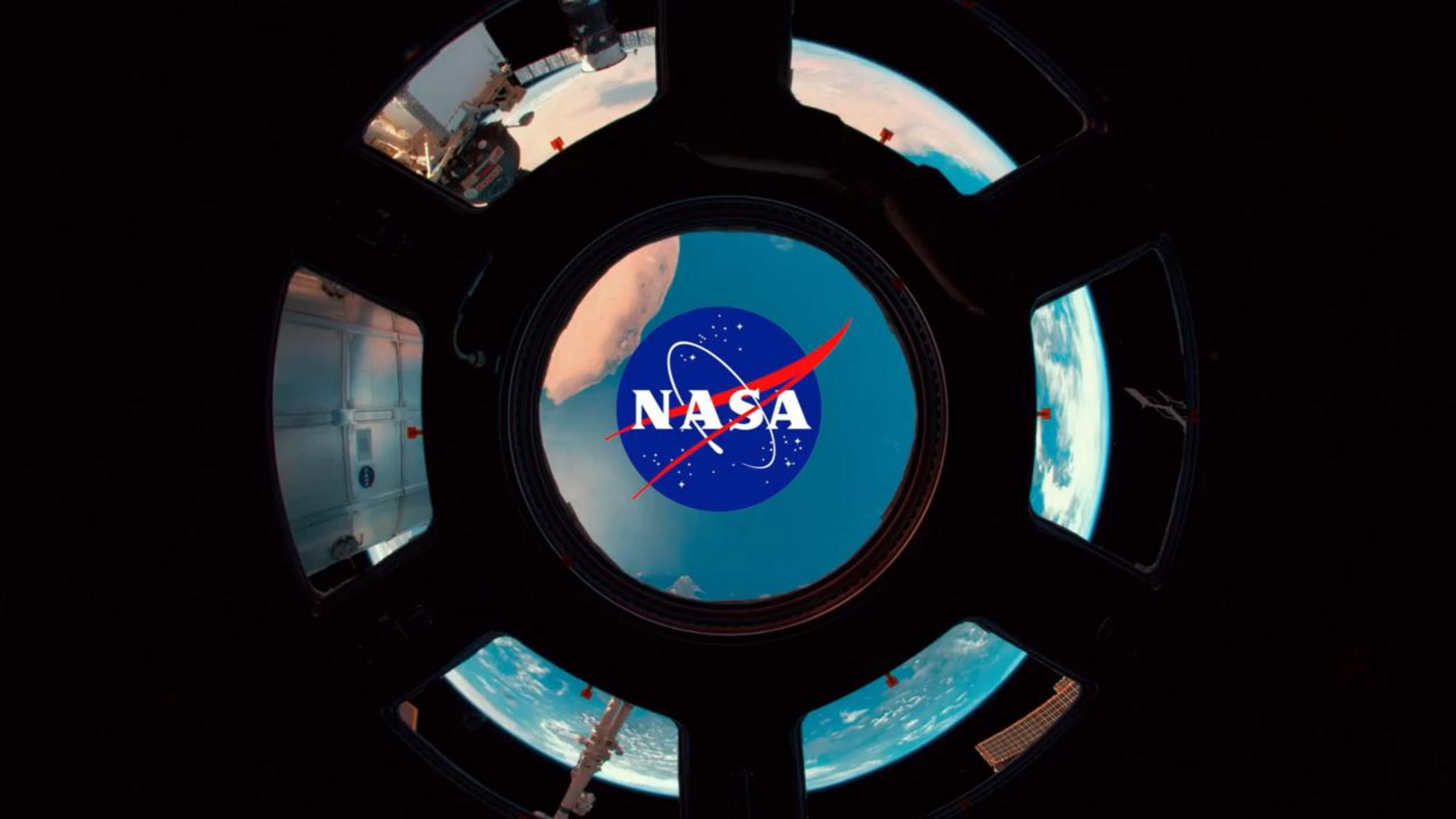


A composite image featuring two astronauts in white space suits shaking hands. The background shows the Earth's horizon with a blue and white atmosphere, and a full moon is visible in the upper left corner. The text 'EXPLORE PARTNERSHIPS' is overlaid in the center.

EXPLORE PARTNERSHIPS

Yolanda Marshall
Strategic Partnerships Manager
HBCU/MSI Technology Infusion Road Tour
August 14, 2019

Partnership – the mutual beneficial arrangement
in which individuals share the risk and reward of
collaboration



NASA Leverages Technology, Expertise, and
Facilities to solve technical challenges for NASA
and Society

Partnering with . . .

- U. S. Industry
- Other Federal Agencies
- Research Institutes
- Public Outreach Organizations (e.g., museums)
- State and Local Government
- **Colleges and Universities**
- Foreign Entities (business, academia, research institutes, governments)
- Professional associations and non-profits

Industry and NASA Advance Technology Together



Advanced Manufacturing



Advanced Technologies



Agriculture



Energy (Rigs)



Life Sciences / Human Performance



Maritime



Transportation and Logistics, and



Aerospace

PARTNERSHIPS

Critical To Overcoming Human Spaceflight Challenges



Monitoring, Safety Systems



Autonomous and Robotic Systems



Inspection Systems



Medical Systems



Habitat Systems



Augmented Reality Systems

Tools for Partnering



- ⚙️ Communities of Practice
- ⚙️ Interagency Agreements
- ⚙️ Space Act Agreements
- ⚙️ Licensing Technologies

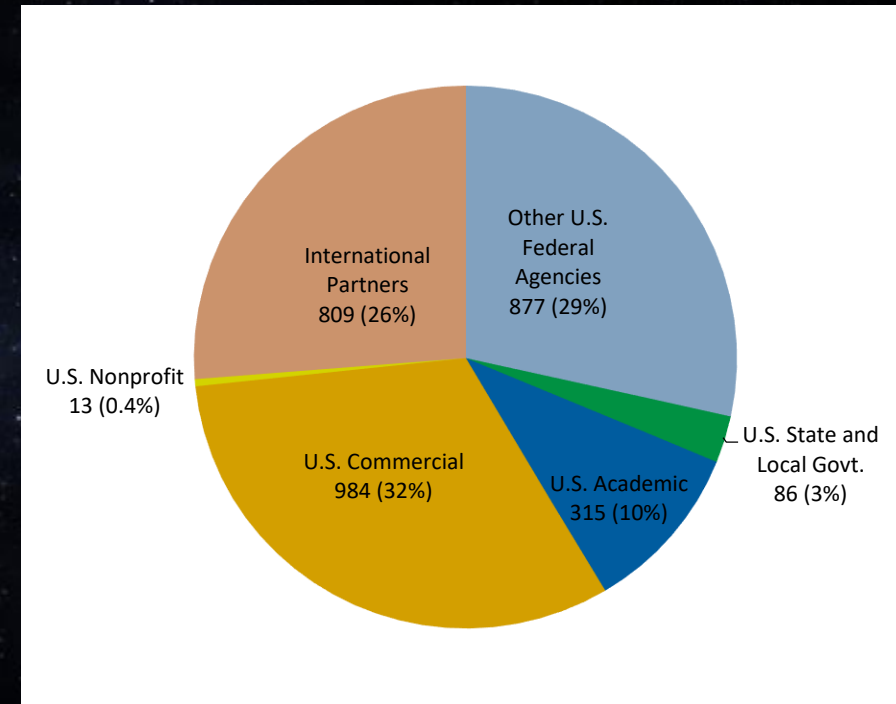
- ⚙️ International Agreements
- ⚙️ Cooperative R&D Agreements
- ⚙️ Software Use Agreements



NASA Partnerships Agreements

(Reimbursable and Non-reimbursable)

- 800-900 new agreements signed each year
- 3,100 active partnership agreements across the Agency, including:
 - 1,400 with the U.S. commercial sector, state & local govts, academic institutions, and non-profits;
 - 900 with other Federal agencies; and
 - 800 with international entities
- Note: Significant NASA resources invested in nonreimbursable (no exchange of funds) partnerships



Number of Active Agreements and % of Total by Partner Segment

National Aeronautics and Space Administration



your journey

2019



Image-Analysis Software Sees Cancer in 3D



Ames Research Center

ERT

Philadelphia, Pennsylvania

NASA Technology

- ◆ NASA studies the health risks of space travel, which can also benefit ground-based medical research
- ◆ One health risk only detected when space missions extended from weeks to months: vision changes
- ◆ One theory suggests these changes are related to blood flowing differently in zero gravity



Technology Transfer

- ◆ In an earlier study, funded partly by Ames, Ron Midura of Cleveland Clinic's Learner Research Institute investigated vascular remodeling due to space travel
- ◆ Midura worked with ERT to develop software that would help analyze vascular images for changes
- ◆ The software has since been used for clinical studies

Benefits

- ◆ The advanced imaging software is called ImageIQ
- ◆ It removes human variability by having a computer analyze an image pixel-by-pixel
- ◆ The software can detect the 3D shape of a tumor by analyzing a series of 2D images, which can aid in diagnosis and in excision surgery
- ◆ Also helps study pulmonary embolisms, aneurysms and lesions

Biofeedback Loops Aim to Augment Sports, Military Training



Langley Research Center

***J&F Alliance Group Inc.
Hampton, Virginia***

NASA Technology

- ◆ Pilot distractibility during flight was a concern, so NASA developed an index for measuring engagement by observing brainwave outputs
- ◆ Test subjects who were shown their engagement level, as determined by brainwave output while performing a task, learned to control their focus



Technology Transfer

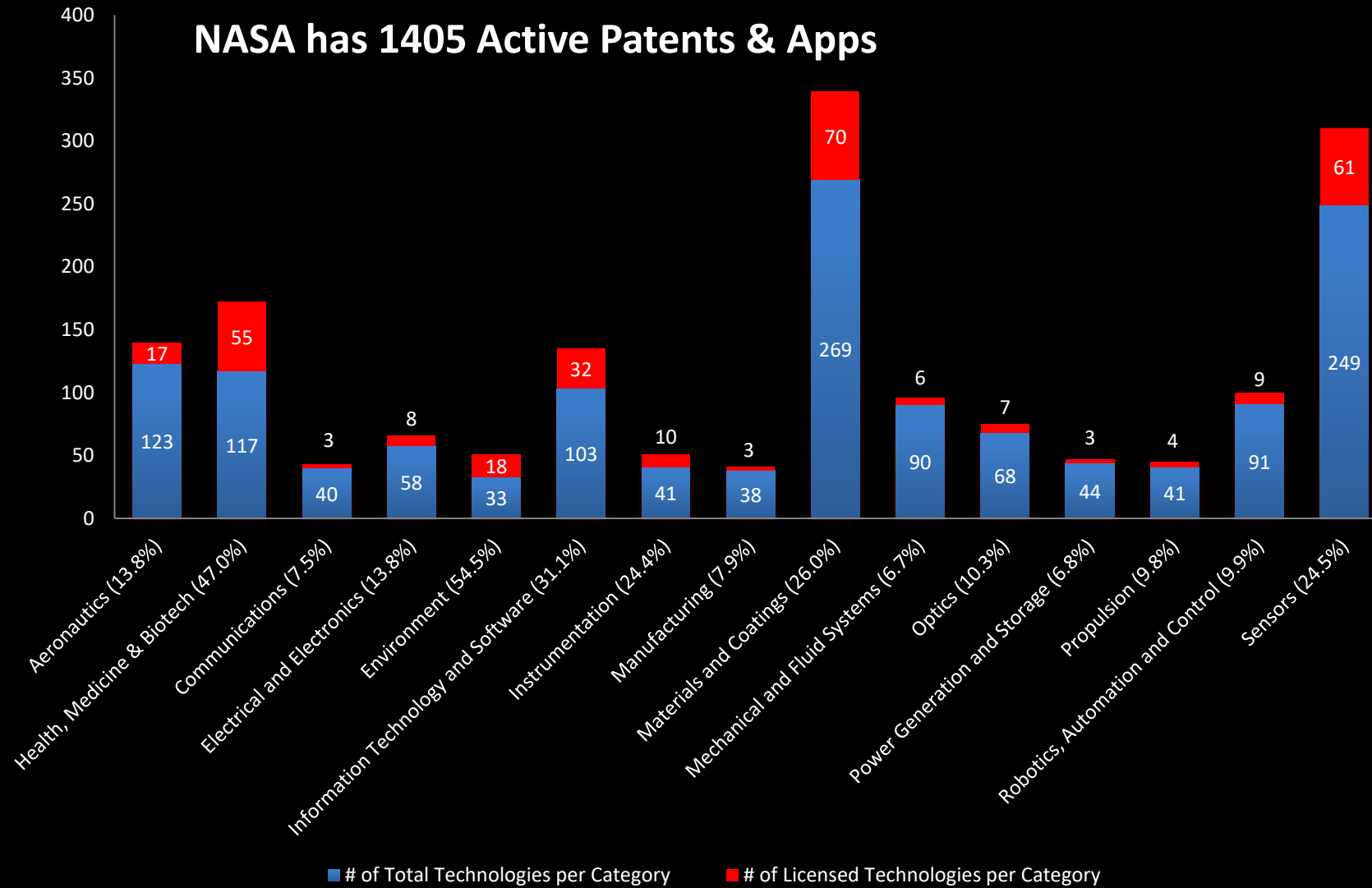
- ◆ Games incorporating biofeedback were created to test and train pilots—MindShift, a video game, and a putting green, Zeroing Out Negative Effects (ZONE)
- ◆ J&F licensed ZONE and MindShift technologies to use with virtual reality and augmented reality training
- ◆ Merging physiological data with a virtual reality world is a new approach for military/police training

Benefits

- ◆ Biocyber Physical System will train the user to enter a state of heightened engagement and calmness by making targets easier to hit in response to higher outputs of beta waves
- ◆ Sports training, healthcare, and education are additional areas that can benefit from virtual reality training with biofeedback

NASA's Patent Portfolio

“Bringing NASA Technology Down to Earth”



For a full listing of available NASA patents and patent applications available for licensing, visit <http://technology.nasa.gov/patents>





business systems and
project management



data servers processing
and handling



materials and
processes



system testing



propulsion



electronics and
electrical power



operations



structures and
mechanisms



environmental
science



design and
integration tools



crew and life
support



autonomous
systems



vehicle
management



data and image
processing



aeronautics

For free access to over 1,000
NASA software programs, visit
<http://software.nasa.gov>

Visit:

Technology.nasa.gov/startup

Calling
All High Tech
Entrepreneurs!



NASA's Technology Transfer Program
is offering you a new opportunity to put
NASA technologies to work for you.

Our Startup NASA initiative helps address two of the biggest
challenges faced by start up companies: raising capital and
securing intellectual property rights.





SBIR/STTR

Small Business Innovation Research / Small Business Technology Transfer

Title	Firm	Award Amount	State	Mission Directorate	Center	Year
A2.01-3104 (SBIR 2019-1) Imaging, Filtered Light Scattering Velocity Diagnostic	Southwest Sciences, Inc. Alan Stanton, astanton@swsciences.com	Not Available Yet	NM	Aeronautics Research	AFRC	2019
H9.03-3622 (SBIR 2019-1) Efficient Realistic Conjunction Analysis (EReCA)	Stellar Science Ltd Co David Myers, djm@stellarscience.com	Not Available Yet	NM	Human Exploration and Operations	GSFC	2019
S1.08-2687 (SBIR 2019-1) Multigas Diode Laser Instrument for Unmanned Aerial Vehicles	Southwest Sciences, Inc. Alan Stanton, astanton@swsciences.com	Not Available Yet	NM	Science	ARC	2019
H1.01-1095 (SBIR 2018-1) Gas Inlet Sensor for Measuring Dust Particle Size Distribution and Concentration	Southwest Sciences, Inc. Alan Stanton, astanton@swsciences.com	\$123,968.00	NM	Human Exploration and Operations	KSC	2018
S2.02-3773 (SBIR 2018-1) Near-Zero CTE 3D Printed RoboSiC Deployable Truss Core Structures with Active Precision Adjustment	Goodman Technologies, LLC William Goodman, bgoodman@goodmantechologies.com	\$124,983.00	NM	Science	JPL	2018
S1.11-3913 (SBIR 2018-1) Millimeter Scale Magnetometer	Southwest Sciences, Inc. Alan Stanton, astanton@swsciences.com	\$124,999.00	NM	Science	GSFC	2018
A3.03-4052 (SBIR 2018-1) Future Aviation Systems Safety	XL Scientific, LLC Susan Haverland, susan.haverland@xlscientific.com	\$123,374.00	NM	Aeronautics Research	LaRC	2018
H9.01-8113 (SBIR 2018-1) Ultra-Lightweight, Ultra-Stable RoboSiC Additively Manufactured Lasercom Telescope	Goodman Technologies, LLC William Goodman, bgoodman@goodmantechologies.com	\$124,983.00	NM	Human Exploration and Operations	JPL	2018
T7.02-8052 (STTR 2018-1) Tailoring the Solar Spectrum for Enhanced Crop Yield for Space Missions	UbiQD Hunter McDaniel, hunter@ubiqd.com	\$124,998.00	NM	Small Business Technology Transfer	KSC	2018
H9.01-8113 (SBIR 2018-2) Ultra-Lightweight, Ultra-Stable RoboSiC Additively Manufactured Lasercom Telescope	Goodman Technologies, LLC William Goodman, bgoodman@goodmantechologies.com	Not Available Yet	NM	Human Exploration and Operations	JPL	2018



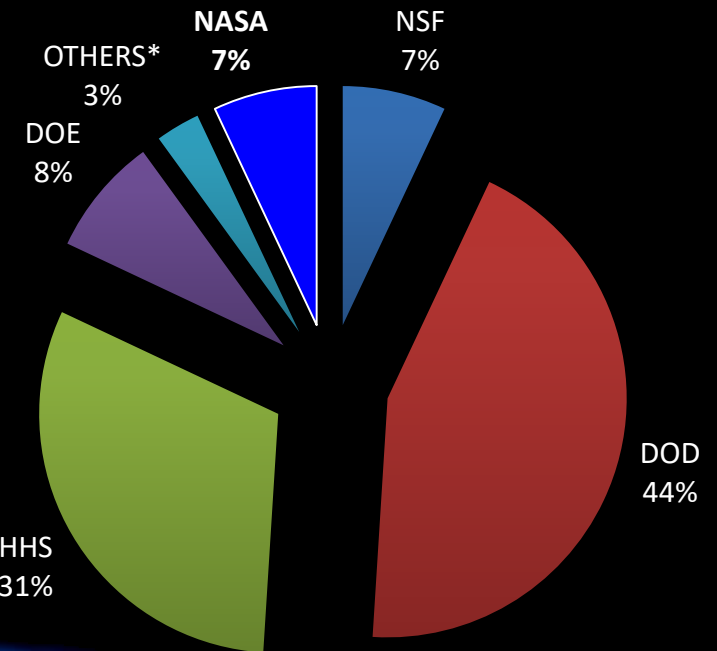
SBIR/STTR

Small Business Innovation Research / Small Business Technology Transfer

Title	Description	Research Institution Name	Firm Name	Year	State
Wideband Autonomous Cognitive Radios for Networked Satellites Communications	Bluecom Systems was able to develop a comprehensive design for realizing such a WACR and demonstrate the proof-of-concept operation in a hardware-in-the-loop simulation.	The Regents of the University of New Mexico	Bluecom Systems And Consulting, LLC	2015	NM

SBIR/STTR Investment NASA Compared to Other Agencies

SBIR and STTR	SBIR Only
DOD - \$1,000M	USDA - \$18M
HHS - \$697M	DHS - \$16M
NASA - \$191M	ED - \$13M
DOE - \$184M	DOT - \$8M
NSF - \$153M	DOC - \$7M
	EPA - \$4M



SBIR FY 2019 Solicitation Program Topics

Aeronautics Research

Topic	Topic Title
A1	Air Vehicle Technology
A2	Integrated Flight Systems
A3	Airspace Operations and Safety

Human Exploration/Operations

Topic	Topic Title
H1	In Situ Resource Utilization (ISRU)
H2	Small Payloads for Lunar Missions
H3	Habitation Systems
H4	Extra-Vehicular Activity (EVA)
H5	Lightweight Structures and Materials
H6	Autonomous Systems
H7	In-Space Manufacturing
H8	ISS Utilization and Microgravity Research
H9	Space Communications and Navigation
H10	Ground and Launch Processing
H11	Radiation Protection
H12	Human Research and Health Maintenance

Science

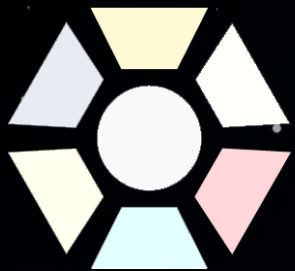
Topic	Topic Title
S1	Sensors, Detectors and Instruments
S2	Advanced Telescope Systems
S3	Spacecraft and Platform Subsystems
S4	Robotic Exploration Technologies
S5	Information Technologies

Space Technology

Topic	Topic Title
Z1	Power & Energy Storage
Z2	Thermal Management
Z3	Advanced Manufacturing
Z4	Lightweight Materials, Structures & Assembly
Z5	Robotics Systems for Space Exploration
Z6	Avionics Technology
Z7	Entry, Descent and Landing Systems
Z8	Small Spacecraft Technologies
Z9	Small Spacecraft Launch Technologies and Demonstration
Z10	In-Space Propulsion Technologies
Z11	Non-Destructive Evaluation Technologies

2019 STTR Focus Areas

2019 STTR Focus Areas	
Focus	Topic Title
1	In Space Propulsion Technologies
3	Autonomous Systems for Space Exploration
4	Robotic Systems for Space Exploration
5	Communications and Navigation
6	Life Support and Habitation Systems
9	Sensors, Detectors and Instruments (subtopics include photonics integrated circuits, intelligent sensor systems, etc.)
11	Spacecraft and Platform Subsystems
14	In-Space and Advanced Manufacturing
15	Materials, Materials Research, Structures and Assembly (thin-ply composites)
16	Ground & Launch Processing
18	Air Vehicle Technology
23	Digital Transformation for Aerospace



ISSR&D
CONFERENCE

Commercial Research on the ISS



Milliken



NOVOPYXIS



Honeywell



NASA Adds Economic Value

NASA benefits the economy through strategic business partnerships in commercial aerospace and Industries from the Biomedical and Petrochemical sectors to Energy, Maritime, and Agriculture sectors. JSC also excels at engaging universities and non-profit institutions to advance innovative technologies that will enable space exploration while improving the economy for the benefit of all.

We Solve Tough Problems with New Technologies:

- Monitoring and Safety Systems
- Autonomous and Robotic Systems
- Inspection Systems
- Medical Systems
- Habitat Systems
- Augmented Reality

Successfully Impacting Texas Industries


Offshore oil workers train at the Neutral Buoyancy Lab



Peggy Whitson working with Magnetic 3D Cells in microgravity



NASA Innovations Are at Work with Partners



Partners in Aerospace:

- Operator of the ISS National Laboratory directing 50% of all U.S. Research on ISS
- SpaceX, Orion, Boeing
- International Partnerships
- Human Research Program

Partners in Industry:

- Advanced Manufacturing
- Agriculture
- Energy
- Life Sciences / Human Performances
- Health, Medicine, and Biotechnology
- Maritime
- Transportation and Logistic

Partners in Academics

NASA University Grants in New Mexico FY19 (\$32,413,274)

- 14 Active Space Act Agreements (HQ, ARC, MSFC, KSC, JSC, GRC)
 - University of New Mexico Collaboration with NASA Glenn Research Center and Air Force Research Lab
- NASA Established Program to Stimulate Competitive Research (EPSCoR) – Just a sample of projects
 - Enhanced Mars Exploration by Characterizing Coats on Rocks
 - Growth of Carbonaceous Materials for Enhanced Material Probes
 - Mars Astrobiology: Pushing the Limits of Organic Detection Using data Fusion of Multiple Technologies

Here Is How to Partner with NASA and Johnson Space Center

EXPLORE
PARTNERSHIPS

Find Us Here:

- SpaceCom
- Technology Collaboration Center
- Offshore Technology Conference
- Houston Texas Medical Center Innovation Institute (TMCx)
- South by Southwest (SXSW)
- Pumps-N-Pipes
- Rockets and Rigs
- NASAiTech
- **Federal Small Business Summit**

Partnership Methods:

- Co-development
- Technology Infusion
- Technology Transfer
- Communities of Practice
- Cooperative Agreements
- Software Use Agreements

Partnership Tools:

- Space Act Agreements
- SBIR/STTR - \$147M FY 2017
- Licensing Patents – NASA has 1,405 active patents and applications

nasa.gov/content/engage-us/



National Institute of Aerospace

NASA leads the way in scientific discovery of the Earth, of other worlds and of the cosmos. Advancing new technologies in aeronautics and space systems, NASA's missions expand the frontiers of human experience and allow American industry to cultivate a growing space marketplace.

NASAiTech provides a platform for NASA's Center Chief Technologists to vet the start-up companies' technologies for their space application, and volunteer investors and external Subject Matter Experts to vet the technologies for their commercial market viability.

Through NASA iTech, we reach beyond traditional partnerships into early, independent innovation. NASA iTech identifies the innovations we will need in the future (and the people behind them).

NASAiTech connects [innovators](#) with [investors](#) who can help propel them forward, and industry leaders who can partner or invest in the technologies.

EFFECTIVE: The first 50 finalist companies that have participated in the NASAiTech Forums have been able to raise \$410 million in private investments in just 2.5 years, while NASA grows a list of technologies it may use for future missions.

Impact



**2.5
YEARS**

since the first
NASA iTech
Forum
addressing...



**24 FOCUS
AREAS**

showcasing...



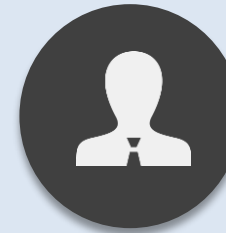
**500+
SOLUTIONS**

which were evaluated
for both business and
technical excellence
from...



**50
FINALISTS**

presenting to...



**2,198 ATTENDEES,
30 INVESTORS
and 79 JUDGES**

from government, industry
and universities from...



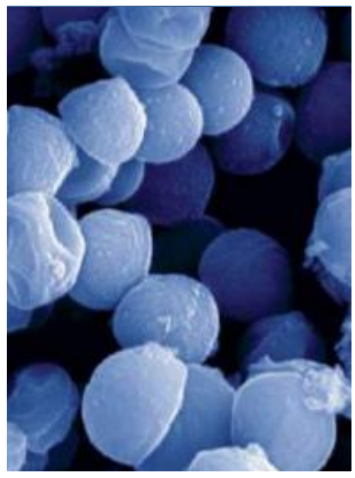
**28 STATES and
6 COUNTRIES**

with technologies
generating...



\$410+ MILLION of Private Investment Dollars.

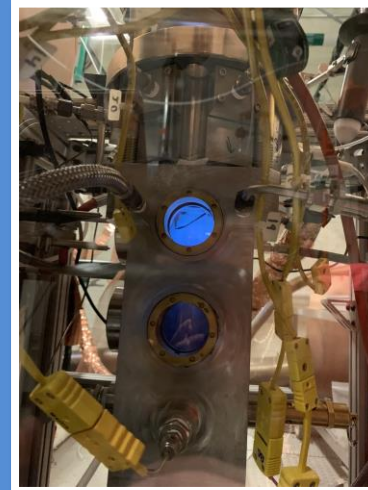
NASA iTech Finalist Transition Examples



Aequor Inc.

Family of chemicals developed from marine life that prevents biofilms from forming. ISS now has over 100 biofilm-forming pathogens.

NASA MSFC began testing Aequor's molecules in 2018 at & in July 2019, presented evidence that Aequor's non-toxic chemicals removed the bacterial biofilm from the water recycling/reuse simulator -- which is critical for life support during long-duration Space travel, colonizing the Moon, Mars, and beyond!



FGC Plasma Solutions

Plasma injection technology for use in jet engines with the effect of improving combustion by ~2% improving mileage and reducing emissions.

Company has received **\$4.4 M in SBIR's** Phase I & Phase II's from NASA, DOD & DOE & hope to close a seed round soon. They have also entered into an agreement with an undisclosed jet engine manufacturer & were selected for a \$1.9M USAF/DARPA contract for their hypersonic work.



Enduralock

Custom fasteners that are: positive locking, vibration tested, easy to remove & install, reusable, usable in harsh environments, able to be reapplied from a blind approach, & vibration resistant when there is a loss of pre-load.

NASA MSFC, SSC, & GSFC working with Enduralock & believe "this fastener could have made a huge difference in addressing the JWST sun shield loose fastener parts issue, reducing delays which could have been a significant cost savings to NASA". Hardware has been space certified, vibration tested (10X the aerospace industry requirement), & is undergoing thermal testing.



Germfalcon

A variety of products using different form factors that employ UV-C light to sterilize/disinfect aircraft, hotel rooms, hospital operating rooms and the ISS.

Germfalcon is partnering with Northrop Grumman & in discussions with NASA JSC CCT office to find ways to modify the design & try to test the product.

Areas of Focus

Improve Energy Storage Density

Radiation - Protection, Mitigation, and Hardware

Power Efficient Technologies

Medical Breakthroughs

X-Factor:

Innovations so compelling NASA should know

<https://youtu.be/V7sY6dlovrk>

2019 Cycle II Forum



2019 Cycle II Forum

Las Cruces, New Mexico

10/7/19 - 10/8/19

Join us as the Top 10 Finalists present their technologies!

<https://youtu.be/avAJyoKO8mY>

A wide-angle photograph of the moon's surface. In the foreground, the Apollo Lunar Module is partially visible on the left, and a large cylindrical tank on a tripod stand is on the right. The ground is covered in dark, fine-grained lunar soil. In the background, a bright sun is low on the horizon, creating a strong lens flare and illuminating the scene.

Let's go! *The time is now.*

We have the capability

We have the purpose

We have the charge

We have the responsibility



Thank you!



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Mail Code XT
Houston, TX 77058

<https://www.nasa.gov/partnerships.html>

Or visit

<http://technology.jsc.nasa.gov>

<http://technology.nasa.gov>

Or visit for SBIR/STTR

<https://sbir.nasa.gov/>

